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on March 27, 2002

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Date of Signature

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COPY OF PAPERS ORIGINALLY FILED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Farr et al.
Serial No.:	10/081,483
Filed:	February 22, 2002
For:	EFFERVESCENT BEVERAGE PRODUCT

Edgewater, New Jersey 07020
March 27, 2002

SUBMISSION OF PRIORITY DOCUMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to rule 55(b) of the Rules of Practice in Patent Cases, Applicant(s) is/are submitting herewith a certified copy of the European Application No. 01302000.3 filed March 5, 2001, United Kingdom Application No. 0112473.4 filed May 23, 2001; United Kingdom Application No. 0112757.0 filed May 25, 2001; and United Kingdom Application No. 0122150.6 filed September 13, 2001, upon which the claim for priority under 35 U.S.C. § 119 was made in the United States.

It is respectfully requested that the priority document be made part of the file history.

Respectfully submitted,

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Bescheinigung | Certificate | Attestation

Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

01302000.3

Der Präsident des Europäischen Patentamts; Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets p.o.

R C van Dijk

DEN HAAG, DEN
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Page 2 de l'attestation

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Application no.: 01302000.3
Demande n°:

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Anmelder:
Applicant(s):
Demandeur(s):

UNILEVER PLC
London EC4P 4BQ
UNITED KINGDOM

Bezeichnung der Erfindung:
Title of the invention:
Titre de l'invention:

Two-phase mixture dispensing container

In Anspruch genommene Prioriät(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

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See for title page 1 of the description

C491.01/U

Title: Containers

Field of the Invention

The present invention concerns containers, particularly sealed containers containing a drinkable liquid and a gas under pressure. The containers are particularly suitable for dispensing a gaseous drinkable liquid.

Background to the Invention

Drinkable liquids containing dissolved gas, typically carbon dioxide, such as mineral water, so-called soft drinks etc, are very popular with consumers.

Carbon dioxide is generally the gas of choice employed to gasify a drinkable liquid under pressure, because it is readily soluble in water (having a solubility of 1.69 gkg^{-1} in water at 20°C and atmospheric pressure), cheap, widely available and non-harmful. Further, owing to its solubility properties, when carbon dioxide is mixed under pressure with a drinkable liquid in a container, a substantial proportion of the carbon dioxide remains dissolved in the drinkable liquid when the container is opened to the atmosphere, thus enabling the container to be resealed and stored for a short time if desired, with minimal deterioration to the gaseous liquid.

Conventionally, containers such as cans or bottles are typically used commercially to store and dispense a carbonated drinkable liquid.

Gases which are generally insoluble in water, such as oxygen, are not usually employed in a drinkable liquid in the same manner as more soluble gases such as carbon dioxide, owing to their low solubility properties. Oxygen has a solubility of 0.043 gkg^{-1} in water at 20°C and atmospheric pressure. As a result, when oxygen is added to a drinkable liquid under

atmospheric conditions, or a container holding a pressurised oxygenated drinkable liquid is opened to the atmosphere, a substantial proportion of the oxygen contained in the liquid will rapidly escape from the solution and be dispersed in the surrounding atmosphere.

US 5,378,480 describes a method of preparing an oxygenated beverage which is to be immediately ingested following preparation. The method comprises the steps of measuring out in a container a quantity of powder comprising a foaming agent capable of trapping and temporarily holding oxygen gas, adding thereto a predetermined quantity of liquid, evenly mixing the powder and liquid to produce a foamed beverage, and using a hand-held oxygen canister to evenly disperse oxygen throughout the beverage within the container via a dispensing tube. The document teaches that the beverage is to be immediately ingested following preparation, as the oxygen content of the beverage will be rapidly lost.

JP 1168269 concerns a method of improving the flavour of a drink by generating bubbles in the drink which contain a large amount of oxygen. The drink is gasified via the dispersion of oxygenated water into the drink from a sealed vessel comprising a tube, valve and spray nozzle, which vessel is loaded with pressurised oxygen, and water into which a high concentration of oxygen has been dissolved. Both the water containing oxygen dissolved therein and pressurised oxygen are in mutual contact. Operation of the spray nozzle opens the valve which enables release of the water containing oxygen dissolved therein.

Summary of the Invention

According to a first aspect of the present invention, there is provided a sealed container containing a drinkable liquid and gas under pressure, the container having a tube extending from the interior to the exterior thereof; a closure member normally closing the tube and operable from the exterior of the container to open the tube; and an aperture in the tube within the container.

In use, when the closure member is operated to open the tube, a stream of drinkable liquid flows through the tube and entrains pressurised gas therein, resulting in a two-phase mixture

of gas and liquid being expelled from the container via the tube. This behaviour is subject to the container being in an appropriate orientation, as discussed below.

Whilst not wishing to be bound by theory, it is thought that the mechanism by which gas is entrained in the drinkable liquid, resulting in the expulsion from the sealed container of a two-phase mixture of gas and liquid is as follows: The sealed container contains a drinkable liquid and gas under pressure. Thus, the pressure inside the sealed container (p) is greater than the pressure outside the sealed container, typically p_{atm} (or atmospheric pressure). When the closure member is operated from the exterior of the container to open the tube, a stream of drinkable liquid flows through the tube towards the closure member before being expelled from the container via the tube, such that the pressure inside the tube, proximate the aperture (p_t), will be less than the pressure inside the sealed container (p), thereby resulting in gas being entrained via the aperture into the moving stream of drinkable liquid. The differential pressure between p and p_t is thought to be attributed to the Bernoulli effect which ensures that a moving stream of drinkable liquid has a lower pressure than the stationary drinkable liquid in the container. Moreover, because of viscous effects in the gas, a pressure differential between both ends of the tube is required to maintain a continuous flow of the mixture of drinkable liquid and gas. Typically, the end of the tube exterior of the container is of a lower pressure than the end of the tube which extends to the interior the container. Preferably, the aperture is positioned near the lower pressure end of the tube, i.e. near to where the tube leaves the container, thus providing an additional contribution to the pressure reduction proximate the aperture.

The drinkable liquid and gas are expelled from the container simultaneously in a two-phase mixture.

The proportions of drinkable liquid and gas expelled together from the container are generally dependent upon the size of the aperture (or apertures). Generally, the appropriate size of the aperture depends upon the desired proportions of liquid and gas to be delivered and can be varied accordingly. However, if the aperture is sufficiently large, 100% of the gas will be expelled, while if the aperture is sufficiently small then 100% of the drinkable liquid will be expelled, followed by gas. The size of the aperture in the tube is usually

between these extremes to enable a two-phase mixture of gas and liquid to be expelled from the container.

The term "drinkable liquid" as used herein means any liquid which is toxicologically safe for consumption by a mammalian subject. Suitable drinkable liquids for use herein therefore include water and beverages which may be alcoholic or non-alcoholic, natural e.g. fruit juice or synthetic. Additionally, or alternatively, the sealed container may comprise a mixture of drinkable liquids. A drinkable liquid may optionally comprise suitable flavourings e.g. sugar, fruit acids etc.; salts; vitamins and food grade dyes etc.

Typically, the drinkable liquid comprises between 20% and 90%, and preferably between 50% and 80%, of the total volumetric capacity of the sealed container.

The sealed container additionally contains one or more gases under pressure, with each gas either being soluble or insoluble in the drinkable liquid. For example, the sealed container may contain a mixture of soluble and insoluble gases in varying proportions.

Suitable insoluble gases for use in a sealed container in accordance with the present invention include oxygen and nitrogen, or mixtures thereof. Preferably, the insoluble gas is oxygen.

A suitable soluble gas for use herein includes carbon dioxide.

Preferably, the gas is insoluble in the drinkable liquid, or alternatively, the gas is a mixture of soluble and insoluble gases in the drinkable liquid in varying proportions. More preferably, the gas is insoluble in the drinkable liquid, and as such is particularly oxygen, which may optionally be admixed with a soluble gas e.g. carbon dioxide in varying proportions. The drinkable liquid may therefore be substantially still if the gas is oxygen alone, or alternatively gaseous if a proportion of soluble gas such as carbon dioxide is employed therein.

Accordingly, the preference for oxygen as the gas for use in a sealed container herein enables a highly gaseous (i.e. highly oxygenated) stream of drinkable liquid to be dispensed from the sealed container. By "highly gaseous" it is meant that the total quantity i.e. volume of gas present in the two-phase mixture of gas and drinkable liquid (at atmospheric pressure and 20°C) is at least equal to one half of the volume of the drinkable liquid present in said composition. Typically, the quantity of gas, particularly oxygen, expelled from the sealed container may be greater than 0.5 cubic centimetres per 1 cubic centimetre of drinkable liquid e.g. water (at atmosphere pressure and 20°C).

Typically, the gas in a sealed container is under a pressure greater than atmospheric pressure and up to 10 atmospheres gauge. Preferably the gas is under a pressure in the range from 3 to 6 atmospheres gauge and is typically about 4 atmospheres gauge.

Generally, the gas comprises between 10% and 80%, and preferably between 20% and 50%, of the total volumetric capacity of the sealed container.

The two-phase mixture of gas and drinkable liquid may be expelled from the sealed container in a number of different forms including as a foam, spray, or gasified or bubbly liquid.

The closure member, typically a valve, can take any number of suitable forms e.g. a conventional aerosol-type valve and/or a push-button valve and may be operated manually by hand and/or by the mouth. Generally, the closure member closes the tube of the container and is located outside the container, thus enabling it to be readily and directly operated by the user from the exterior of the container to open the tube and expel the drinkable liquid with entrained gas therein. The amount of two-phase mixture of gas and liquid being expelled from the container can thus be regulated by the user via the closure member.

Sealed containers for use herein may be of any suitable shape or size. The capacity of the container will depend on the intended use. Containers for personal use generally have a capacity of less than 5 litres, preferably less than 3 litres, and typically have a capacity of less than about 1 litre. The sealed container is typically a bottle (although other forms of

container are possible), the bottle having a base and a neck, with the tube passing from the interior to the exterior of the container, i.e. bottle, through said neck. When the sealed container is a bottle, it is typically formed from either glass or plastics material and sealed with a cap or lid, which may be attached to the bottle by, for example, a screw thread or crimping. Alternatively, when the closure member of the container i.e. bottle is a valve, particularly an aerosol-type valve, the bottle may be sealed by crimping onto the neck of the bottle, the valve housing of the aerosol-type valve. Optionally, one or more washers may be required to form an airtight seal. The bottle preferably has a curvaceous shape including a bulbous lower portion and bulbous upper portion connected by a narrow waist portion therebetween which enables the user to readily grip the container. Extending from the upper portion is the neck of the container.

The tube is typically formed from any suitable material, e.g. plastics material and is generally relatively rigid and straight. Generally, the length and width of the tube depend upon a number of factors including the size and capacity of the container, together with the total amount of drinkable liquid it is desired to expel. Preferably, the tube is suitably long so that it extends nearly fully into the container to enable the maximum extraction of drinkable liquid therefrom.

The one or more apertures in the tube within the container are usually near to where the tube leaves the container, i.e. in preferred embodiments near the neck of the bottle. Generally, the aperture is upstream of the closure member.

A sealed container in accordance with the present invention is normally to be used in a generally upright position with the region where the tube leaves the container uppermost. For bottle embodiments, this region will be the neck which is generally vertically above the base. In this position, the tube normally extends into the drinkable liquid. Preferably, the tube extends to near the bottom of the drinkable liquid with the aperture above the drinkable liquid in the gas. When the closure member is operated from the exterior of the container to open the tube, gas is entrained via the aperture into the stream of drinkable liquid which flows through the tube. When the closure member is operated to close the tube, the flow of two-phase mixture of gas and drinkable liquid is terminated. The closure member may be

operated as often as desired in this manner by the user until the supply of drinkable liquid and gas is exhausted.

The container may also be used in other positions. In the extreme case, the container may be inverted with respect to the position described above. In this position, the tube normally extends into the gas, with the aperture below the gas in the drinkable liquid. When the closure member is operated from the exterior of the container to open the tube, gas will flow through the tube and be expelled with a small amount of drinkable liquid entrained therein (provided that the aperture is sufficiently large).

Sealed containers in accordance with the present invention may be used to deliver a two-phase mixture of gas and drinkable liquid to the mouth or surface of the skin of a user, particularly the face.

Thus, according to a further aspect of the present invention, there is provided a method of delivery, to the mouth or surface of the skin, of a two-phase mixture of drinkable liquid and gas using a sealed container in accordance with the present invention.

Suitable skin surfaces include those found on the face, arms, hands, legs, torso, neck, feet etc.

The present invention provides a convenient and efficient means of controllably delivering a drinkable liquid and gas simultaneously in a two-phase mixture to the mouth or surface of the skin, particularly the face, of a user, creating a pleasant, invigorating and refreshing in-use sensation. None of the prior art teaches, in either structural or functional terms, a container from which a drinkable liquid and gas, particularly a gas insoluble in the liquid, may be simultaneously delivered in a two-phase mixture. Thus, unlike the containers of the prior art which generally require the drinkable liquid and gas to be premixed to saturate the liquid with gas, containers in accordance with the present invention enable the gas to be mixed with the drinkable liquid in situ within the sealed container and be expelled directly therefrom as a two-phase mixture. Thus, containers described herein can deliver a greater amount of gas directly to a skin surface or the mouth than has hitherto been possible.

Further, the nature of the container is such that it conveniently prevents spillage and wastage of the contents.

Sealed containers according to the present invention are particularly suitable for the delivery of an oxygenated drink and therefore find particular application on the club scene, in bars e.g. for the delivery of an oxygenated alcoholic or non-alcoholic drink, and in the field of sports and/or dietary supplement drinks.

The invention will be further described, by way of illustration, with reference to the accompanying drawings, in which:

Figure 1 is a schematic sectional view of a preferred embodiment of a sealed container in accordance with the present invention; and

Figure 2 is an enlarged sectional view of the closure member of the sealed container of Figure 1.

Detailed Description of the Drawings

Referring to the drawings, Figure 1 illustrates a sealed container in the form of a bottle 10 of rigid plastics material having a base 12 and a neck 14. The capacity of the illustrated container is about 1 litre, but containers of other sizes may be employed depending upon the intended use of said container. The bottle 10 is of curvaceous shape, having a bulbous lower portion 16 and a bulbous upper portion 18 connected via a narrow waist portion 20. The bottle 10 is shaped to facilitate holding thereof by a user.

The bottle includes a straight straw 22 of rigid plastics material. The lower end 24 of the straw 22 extends nearly to the base 12 of the bottle 10 and the upper end 26 is connected to an aerosol valve 28. An aperture 30 is provided in the wall of the straw 22 near the upper end 26 thereof.

Valve 28 is sealed within the neck 14 of the bottle 10 and is connected on the exterior of the bottle to a nozzle 32. The straw 22, valve 28 and nozzle 32 together constitute a tube extending from the interior of the bottle to the exterior thereof.

Valve 28 is illustrated on a larger scale in Figure 2. The valve comprises a generally tubular rigid valve body 40 having a wider diameter upper portion 42 and a narrower diameter lower portion 44 linked by a tapered portion 46. The bottom of the lower portion 44 constitutes an inlet that is sealingly connected to the upper end 26 of straw 22.

The upper portion 42 and tapered portion 46 of the valve body 40 define a cavity 48 into which extends part of a generally cylindrical valve stem 50. Extending through valve stem 50 is an axial bore 52 with side passage 54. An annular inner gasket 56 is secured to the upper end of the valve body 40 and functions to retain the valve stem 50 in position. A spring 58 is located within the cavity 48 of the valve body 40 and functions to bias the valve stem upwardly to the position shown in the drawings. In this position, the opening of side passage 54 of valve stem 50 is seated against the inner gasket 56 thus closing the passageway through the valve stem 50 and hence closing the valve. The action of the spring 58 can be overcome by downwards or sideways force on the valve stem 50 resulting in relative movement of the valve stem 50 with respect to the valve body 40 bringing the passageway into fluid communication with the interior of the bottle.

Alternative valve constructions may also be used.

The valve 28 is held within the neck of the bottle by a valve cup 60 with associated outer annular gasket 62. A cap 64 seals the valve within the bottle 10, being attached to the bottle by, for example, a screw thread or crimping. The cap 64, valve 28 and nozzle 32 therefore form an airtight seal at 76. One or more washers may also be required for this purpose.

The bottle 10 contains a drinkable liquid 70, shown in the illustrated embodiment as occupying about half of the volume of the bottle. The bottle also contains oxygen at a pressure of about 4 atmospheres gauge as shown at 72, with the oxygen and drinkable liquid being in mutual contact at interface 74.

In use, with the bottle 10 in the illustrated position, the valve 28 is operated by a user from the exterior of the bottle by downwards or sideways force on nozzle 32, which is communication with valve stem 50, thus resulting in opening of the valve as described above. On opening of the valve, gas is entrained through aperture 30 in straw 22 into the stream of drinkable liquid 70 which flows through straw 22 resulting in the expulsion of a two-phase mixture of drinkable liquid and entrained oxygen from the nozzle. When force is removed from the nozzle 32 the valve 28 closes under the action of spring 58, terminating the flow of the two-phase mixture of drinkable liquid and gas from the bottle. The valve 28 may be operated in this manner as often as desired until the supply of drinkable liquid and gas is exhausted.

The bottle will also function in inverted condition, as described herein above.

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Claims

1. A sealed container containing a drinkable liquid and gas under pressure, the container having a tube extending from the interior to the exterior thereof; a closure member normally closing the tube and operable from the exterior of the container to open the tube; and an aperture in the tube within the container.

2. A sealed container according to claim 1, wherein the gas is soluble or insoluble in the drinkable liquid.

3. A sealed container according to claim 1 or 2, wherein the gas is insoluble in the drinkable liquid.

4. A sealed container according to any one of the preceding claims, wherein the gas is oxygen.

5. A sealed container according to any one of the preceding claims, which comprises a mixture of gases, some soluble and some insoluble in the drinkable liquid.

6. A sealed container according to any one of the preceding claims, wherein the gas is a mixture of carbon dioxide and oxygen.

7. A sealed container according to any one of the preceding claims, wherein the gas comprises between 10% and 80% and the drinkable liquid comprises between 20% and 90% of the total volumetric capacity of the sealed container.

8. A sealed container according to any one of the preceding claims, wherein the quantity of gas expelled from the sealed container is greater than 0.5 cubic centimetres per 1 cubic centimetre of drinkable liquid at atmospheric pressure and 20°C.

9. A sealed container according to any one of the preceding claims, wherein the aperture is upstream of the closure member.

10. A sealed container according to any one of the preceding claims, wherein the closure member is a valve.

11. A sealed container according to any one of the preceding claims, wherein the container is a bottle.

12. A method of delivery, to the mouth or surface of the skin, of a two-phase mixture of drinkable liquid and gas using a sealed container according to any one of the preceding claims.

C491.01/U

Abstract

Title: Containers

The present invention provides a sealed container, typically a bottle, containing a drinkable liquid and gas under pressure, especially oxygen, the container having a tube extending from the interior to the exterior thereof; a closure member normally closing the tube and operable from the exterior of the container to open the tube; and an aperture in the tube within the container.

Sealed containers in accordance with the present invention are particularly suitable for dispensing a two-phase mixture of gas and drinkable liquid to a skin surface, particularly the face, or the mouth of a user.

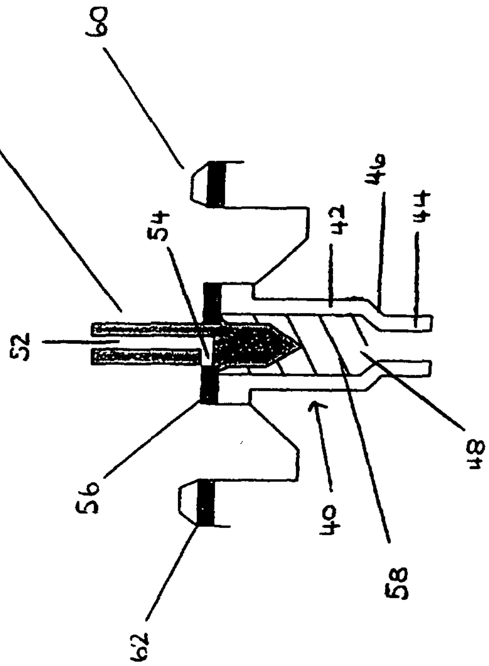

Figure 2

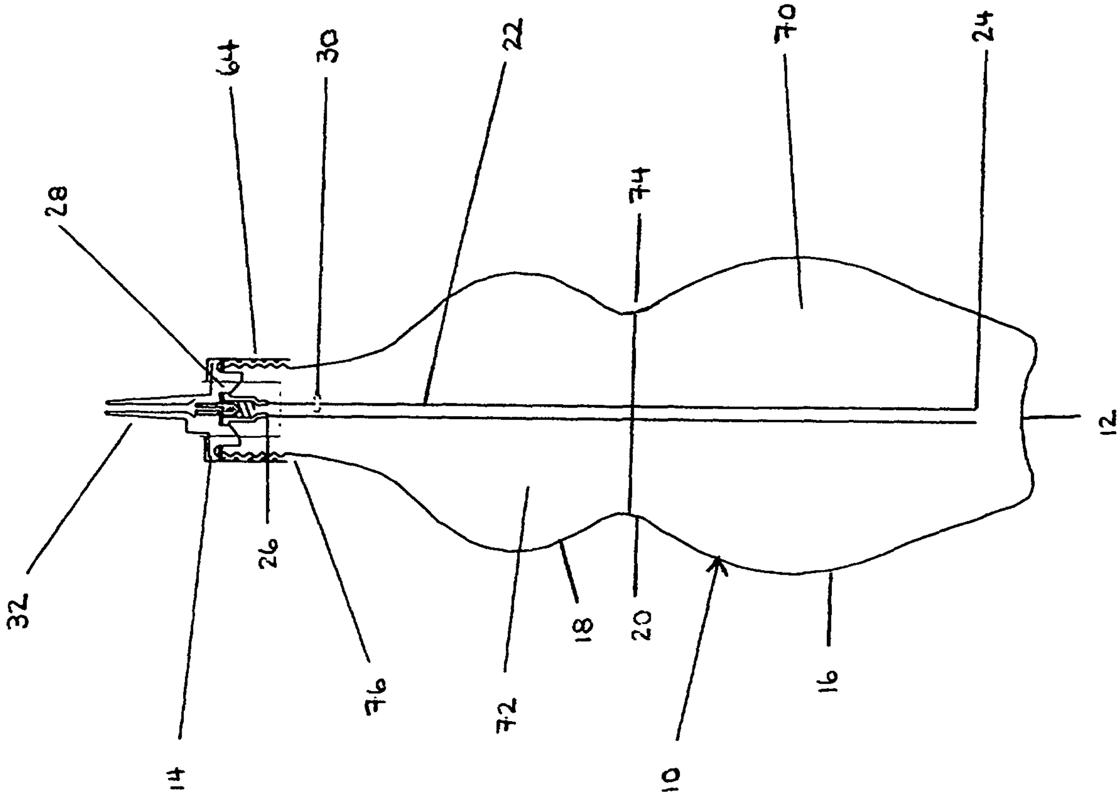

Figure 1